Greenville county Technical Specification for:

RC-01 PIPE SLOPE DRAINS

1.0 Pipe Slope Drains

1.1 Description

Pipe Slope Drains reduce the risk of erosion by discharging concentrated runoff from the top to the bottom of slopes. Pipe Slope Drains are used when it is necessary for water to flow down a slope without causing erosion, especially before a slope has been stabilized or before permanent drainage structures are installed.

Pipe Slope Drains intercept and direct surface runoff into a drainage system, trapping device, or stabilized area. In the appropriate application, pipe slope drains significantly reduce rill and gully erosion on unstable slopes.

Pipe Slope Drains are classified into 2 categories depending on the method of installation and the material used;

- Permanent Pipe Slope Drains.
- Temporary Flexible Pipe Slope Drains.

1.2 Design Criteria

Pipe Slope Drains are designed to pass the peak flow rates for the 10-year 24-hour storm event.

The maximum drainage area allowed per single permanent Pipe Slope Drain is 1.5 acres.

The maximum drainage area allowed per single temporary Pipe Slope Drain is 0.5 acres.

Stabilize the inlets and outlets of a Pipe Slope Drains with flared end sections, Erosion Control Blankets (ECBs), Turf Reinforcement Mats (TRMs) or Riprap. Fully compact the soil around the Pipe Slope Drain entrance to prevent bypassing and undercutting of the structure. Stabilize the discharge end of the Pipe Slope Drain along the bottom of any swales that lead to sediment trapping structures or other stabilized areas.

1.3 Materials

1.3.1 Permanent Pipe Slope Drains

Permanent Pipe Slope Drains are buried beneath the ground surface and are made of permanent materials capable of being buried.

1.2.1.1 Corrugated Aluminum Alloy Pipe (CAAP)

Corrugated aluminum alloy pipe (CAAP) conforming to the requirements of AASHTO M 196 for Type I culvert pipe.

1.2.1.2 Class PS 46 Polyvinyl Chloride (PVC) Pipe

Polyvinyl chloride (PVC) pipe conforming to the requirements of AASHTO M 278, Class PS 46, cell classification 12454-B as defined in ASTM D 1784, or pipe conforming to the requirements of ASTM D 3034, SR 35.

1.2.1.3 Corrugated High Density Polyethylene (HDPE) Pipe

For up to 10-inch diameter permanent Pipe Slope Drains only, use corrugated high density polyethylene (HDPE) pipe conforming to the requirements of AASHTO M 252. Larger sizes of HDPE pipe are not recommended for permanent Pipe Slope Drains. Furnish certification from the manufacturer with each shipment stating that the pipe meets the required specifications.

1.2.2 Temporary Flexible Pipe Slope Drains

Temporary Pipe Slope Drains, usually flexible tubing or conduit, are typically installed prior to construction of permanent drainage structures.

1.2.2.1 Corrugated High Density Polyethylene (HDPE) Pipe

Use corrugated high density polyethylene (HDPE) pipe conforming to the requirements of AASHTO M 294 Type C or Type S.

1.2.3 Metal Intake Spillway Assembly

When specified on the Plan or directed by the Engineer, fabricate metal intake spillway assembly from steel conforming to the requirements of AASHTO M 218.

1.3 Construction Requirements

1.3.1 Equipment

Ensure that the equipment necessary for the proper construction of the work is on site, in acceptable working condition, and approved by the Engineer as to both type and condition before the start of work. Provide sufficient equipment to enable prosecution of the work in accordance with the project schedule and completion of the work in the specified time.

1.3.2 Installation

Construct all Pipe Slope Drains and intake assemblies in conformance with the Plans, Specifications at locations designated by the Engineer. Lay the pipe and perform all construction in accordance with this Specification. Provide a stable foundation for all Pipe Slope Drains by placing drains on well compacted soil.

Fasten pipe joints together with resilient water-tight pipe connectors, bands, couplings and gaskets to prevent separation for all permanent and temporary flexible Pipe Slope Drains.

Table 1 provides Pipe Slope Drain diameters for corresponding drainage areas. Ensure the Pipe Slope Drain is of sufficient size to carry the anticipated peak flow rate of runoff.

Table 1: Pipe Slope Drain Diameter Selection

Pipe Diameter (in)	Drainage Area (ac)
6	0.00 – 0.10
8	0.10 - 0.20
10	0.20 -0.30
12	0.30 – 0.50
15	0.50 – 1.00
18	1.00 – 1.50

Install diversion berms, dikes, sandbags or other runoff conveyance measures a minimum depth/height of 1.5 feet to direct runoff towards and into Pipe Slope Drains. Ensure the height of the berm or runoff conveyance measure around the pipe inlet is at least 0.5 feet higher than the top of the pipe. Compact and stabilize the berm or runoff conveyance measure at the pipe inlet to prevent erosion. Stabilize the area around the inlet with ECBs, TRMs, Riprap or other applicable stabilization techniques.

Extend Pipe Slope Drains at least 4 feet beyond the toe of the slope and ensure a non-erosive discharge using a flared pipe end section, ECBs, TRMs, Riprap, or other applicable erosion prevention practice.

Direct all flows conveying sediment-laden water into a sediment trapping structure.

Immediately stabilize all areas disturbed by the installation Pipe Slope Drains in accordance with the Seeding Specifications.

1.3.2.1 Permanent Pipe Slope Drains

The minimum pipe diameter for permanent pipe slope drains is **6-inches** and the maximum diameter is **18-inches.**

Obtain Engineer acceptance and approval for permanent Pipe Slope Drains with drainage areas larger than 1.5 acres.

Install permanent intake assemblies that function properly and efficiently. Prevent water from percolating under or around them. When an intake assembly is not used in conjunction with the installation of a permanent Pipe Slope Drain, pave the area around and in front of the inlet with approved asphalt surfacing to prevent erosion and undermining of the entrance pipe. Field cut the pipe forming the entrance when necessary to provide a satisfactory entrance.

Bury permanent Pipe Slope Drains at a minimum depth of 1.5 feet.

1.3.2.2 Temporary Flexible Pipe slope Drains

The allowable pipe diameters for temporary flexible Pipe Slope Drains are **8-inches, 10-inches and 12-inches**.

Obtain Engineer acceptance and approval for single temporary flexible Pipe Slope Drains with drainage areas larger than 0.5 acres.

Install temporary flexible Pipe Slope Drains as required or as part of the grading operation where applicable and adjust as directed by the Engineer. Construct a berm or runoff conveyance measure at the top of cut or fill sections to convey runoff into the slope drain and to prevent collected water from spilling over the edge of the slope.

Provide temporary flexible Pipe Slope Drains inlet stabilization with ECBs, TRMs, sand bags, riprap, or other applicable erosion control practice.

Place hold down stakes at 10 feet maximum spacing intervals to secure the pipe to the ground surface. Place a stake on each side of the pipe at a 45 degree angle to secure the pipe. Use wooden stakes a minimum of 4 feet in length with a minimum measured dimension of 3/4 inch x 3/4 inch and a maximum measured dimension of 2 inches x 2 inches, or steel posts (1.25 lbs/ linear foot) a minimum of 4 feet in length. Use steel posts without a kick plate and painting is not required. Drive stakes into the ground to a depth of 2 feet or to the maximum extent practicable.

Immediately stabilize all areas disturbed by the removal of temporary flexible Pipe Slope Drains in accordance with the Seeding Specification.

Removed temporary flexible Pipe Slope Drains may be used again at other temporary locations if the pipe is in a condition acceptable to the Engineer.

1.3.3 Inspection and Maintenance

Inspect Pipe Slope Drain inlet points, outlet points, and pipe integrity every 7 calendar days and inspections are recommended within 24-hours after each rainfall event that produces ½-inches or more of precipitation until final stabilization is achieved.

Reinforce the inlet with sandbags if undercutting is present at the Pipe Slope Drain inlet.

Inspect pipe to ensure no clogging exist. If pipe clogging is a continuing problem, place a screen or grate at the Pipe Slope Drain inlet.

Ensure the outlet point is free of erosion and installed with appropriate outlet protection.

Remove accumulated sediment at the pipe inlet if any blockage occurs.

Decrease drainage area or increase pipe diameter if Pipe Slope Drain overtop.

Remove all temporary Pipe Slope Drains within 30 days after final site stabilization is achieved or after the temporary BMP is no longer needed. Permanently stabilize disturbed soil areas resulting from Pipe Slope Drain removal.

1.3.5 Acceptance

Obtain Engineer acceptance and approval for permanent and temporary Pipe Slope Drain installations.